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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/676,082

10/02/2003

Minoru Toriumi

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EXAMINER

HU, HENRY S

ART UNIT

PAPER NUMBER

1713

DATE MAILED: 01/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/676,082

Applicant(s)

TORIUMI, MINORU

Examiner

Henry S. Hu

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1713

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Amendment of December 8, 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-4, 7, 11 and 15-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-4, 7, 11 and 15-20 is/are rejected.
- 7) ☒ Claim(s) 15 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>12-8-05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This Office Action is in response to **Amendment** (for 2nd non-final) filed on December 8, 2005. In view of the amendment, **parent Claim 15 was further amended to include an initial step of hexamethyldisilazane (HMDS) surface treatment on a surface of a semiconductor substrate so as to carry specific properties on R, η and κ**. The Applicants allege that support of such an amendment is as disclosed on page 5 of Remarks. **Claims 2-4, 7, 11, and 15-20 are now pending** with only one independent claim (Claim 15). An action follows.

Response to Argument

2. Applicant's argument filed on December 8, 2005 has been fully considered but they are not persuasive. The focal arguments related to the patentability will be addressed as follows: In view of the Applicants' argument on pages 5-6 of Remarks as well as with new search, both 102(b) and 103(a) rejections are converted to new **103(a) rejections** due to the amendment on such a step of hexamethyldisilazane (HMDS) surface treatment.

Claim Objections

3. Claim 15 is objected to because of the following informalities:

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On **Claim 15** at line 3, recitation of "HDMS" is improper and should be changed to "HMDS" since it is related to a compound of hexamethyldisilazane.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. *The limitation of amended parent **Claim 15** of present invention relates to a method for manufacturing a semiconductor device, comprising:*

(a)conducting a HDMS (hexamethyldisilazane) treatment on a surface of a semiconductor substrate and forming an anti-reflective coating having a reflectance R within a range of 10% or less, a real part value η of a complex index of refraction within a range of 1.0 to 3.0, and an imaginary part value κ of the complex index within a range of 0.4 to 1.3, by coating a

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composition over the treated semiconductor substrate, the composition including: (i) a first polymer containing fluorine; and (ii) a solvent for dissolving said first polymer;

*(b) **forming a resist film of a polymer containing fluorine** on the anti-reflective coating; and*

*(c) **radiating exposure light** onto the resist film.*

*See other limitations of dependent **Claims 2-4, 7, 11 and 16-20.***

6. Claims 2, 11 and 15-20 are rejected under 35 U.S.C. 103(a) as obvious over Subramanion et al. (US 5,986,344) in view of Takano et al. (US 6,309,789 B1) or Sooriyakumaran et al. (US 2002/0081520 A1) for the reasons set forth in **paragraphs 4-5 of office action dated 9-14-2005 as well as the discussion below.**

7. Claims 2, 11 and 15-20 are rejected under 35 U.S.C. 103(a) as obvious over Padmanaban et al. (US 6,365,322 B1) in view of Subramanion et al. (US 5,986,344) as well as Takano et al. (US 6,309,789 B1) or Sooriyakumaran et al. (US 2002/0081520 A1) for the reasons set forth in **paragraphs 7-8 of office action dated 9-14-2005 as well as the discussion below.**

8. Claims 2, 11 and 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujie et al. (US 6,303,264 B1) in view of Subramanion et al. (US 5,986,344) as well as Takano et al. (US 6,309,789 B1) or Sooriyakumaran et al. (US 2002/0081520 A1) for the reasons set forth in **paragraphs 9-10 of office action dated 9-14-2005 as well as the discussion below.**

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9. Claims 3-4 and 7 are rejected under 35 U.S.C. 103(a) as obvious over Subramanion et al. (US 5,986,344) in view of Takano et al. (US 6,309,789 B1) or Sooriyakumaran et al. (US 2002/0081520 A1), and further in view of Matsuo et al. (US 5,510,406) for the reasons set forth in **paragraph 11 of office action dated 9-14-2005 as well as the discussion below.**

10. Claims 3-4 and 7 are rejected under 35 U.S.C. 103(a) as obvious over Padmanaban et al. (US 6,365,322 B1) in view of Subramanion et al. (US 5,986,344) as well as Takano et al. (US 6,309,789 B1) or Sooriyakumaran et al. (US 2002/0081520 A1), and further in view of Matsuo et al. (US 5,510,406) for the reasons set forth in **paragraph 12 of office action dated 9-14-2005 as well as the discussion below.**

11. **Applicants:** Applicant has claimed in parent **Claim 15** an unexpected way of obtaining a specific **two-layer coating** on semiconductor device by using HMDS on the bottom layer. It now carries **an initial step to apply hexamethyldisilazane (HMDS) surface treatment on a surface of a semiconductor substrate so as to obtain a “fluorinated” anti-reflective coating carrying specific properties on R, η and κ** . In a close examination, the process also involves applying a second “fluorinated” resist layer topping on the anti-reflective layer.

With respect to all previous rejections, the Applicants allege that **Applicants’ distinct product is first prepared in such a specific HNDS process on modification of semiconductor surface** (see page 5 of Remarks). The Applicants further allege that the above-mentioned prior

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art, in combination or alone, fails to teach or suggest such a specific HMDS treatment so as to obtain an anti-reflective coating carrying specific properties on R, η and κ .

12. **Examiner:** In view of the Applicants' new amendment (in response to 2nd Non-Final Office Action) filed on September 14, 2005, twice-amended parent **Claim 15** now carries such an extra step of hexamethyl-disilazane (HMDS) surface treatment on the semiconductor substrate, which all the previous prior art references including Subramanion, Padmanaban, Fujie and Matsuo, in combination or alone, may not teach or suggest at all.

However, after performing a new search it is found that such a HMDS surface modification on semiconductor substrate is well known in making a photo-resist. Each of **Takano and Sooriyakumaran** has disclosed such an extra step before a bilayer, including a fluorinated anti-reflective bottom layer and a resist top layer, is then applied on the surface of semiconductor substrate (see **Takano** at column 11, line 57-67; abstract, line 1-10; see **Sooriyakumaran** at paragraphs 75-77 and 102). By doing so, the advantage is that increasing accuracy of pattern dimension or higher lithographic resolution can be obtained (see **Takano** at column 1, line 5-14; also see examples on columns 13-15; see **Sooriyakumaran** at paragraph 2).

In view of the fact that parent **Claim 15** has been amended to use such a HMDS surface modification on semiconductor substrate, all the previous rejections are thereby converted to become **103 rejections with an extra reference of Takano or Sooriyakumaran**.

Conclusion

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

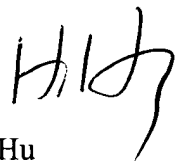
14. Any inquiry concerning this communication or earlier communication from the examiner should be directed to **Dr. Henry S. Hu** whose telephone number is (571) 272-1103. The examiner can be reached on Monday through Friday from 9:00 AM –5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu, can be reached on (571) 272-1114. The fax number for the organization

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where this application or proceeding is assigned is (571) 273-8300 for all regular communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Henry S. Hu

Patent Examiner, Art Unit 1713, USPTO

January 21, 2006



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